

Taxonomic Revision of *Astragalus* sect. *Acanthopace* (Fabaceae)

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Abstract:

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Sect. *Acanthopace* Bunge of the genus *Astragalus* L. is revised taxonomically. The newly described sect. *Lamprocarpa* Maassoumi is reduced to synonymy under sect. *Acanthopace*. The systematic position of *Astragalus pseudoangustifolius* Sirj. & Rech.f. and *A. cryptocarpus* DC. is clarified through selection of epitypes. *A. cystosus* Zarre & Podlech and *A. hezarensis* Zarre & Podlech are described as new species here for the first time.

Zusammenfassung:

Eine Revision von *Astragalus* L. sect. *Acanthopace* Bunge wird vorgelegt. Die erst kürzlich beschriebene Sekt. *Lamprocarpa* Maassoumi wird als Synonym zu *Acanthopace* gestellt. Die systematische Position von *A. pseudoangustifolius* Sirj. & Rech.f. und *A. cryptocarpus* DC. wird durch die Wahl von Epitypen fixiert. *A. cystosus* Zarre & Podlech und *A. hezarensis* Zarre & Podlech werden als neue Arten beschrieben.

Introduction

Sect. *Acanthopace* Bunge is revised here in the frame work of preparing a treatment of the thorny *Astragalus* groups for the Flora Iranica. A complete revision of this section and sect. *Aegacantha* Bunge was published by I. DEML in 1972. However, due to the poor availability of material to the author at the time and the unclear borders between the sections of the thorny *Astragali*, her work was a preliminary one and it was necessary to revise the section again. In the famous work of BUNGE (1868/1869) this section was classified under subgen. *Phaca* Bunge, characterized by large pods rupturing the calyx. The current systematic position of sect. *Acanthopace* is, however, within subgen. *Astragalus* (see PODLECH 1982). It has been shown that this section is a basal group within thorny *Astragalus* and there are several symplesiomorphies shared by the species belonging to this section. Presence of flattened ribbon-like and papillose hairs, large ligneous pods and a standard not sharply differentiated to claw and limb are some such symplesiomorphies (ZARRE 2000).

This relatively small section is heterogeneous, so the attribution of some species to the section is doubtful. For this reason MAASSOUMI (1995) separated *A. ovigerus* [as a new

species *A. lamprocarpus*] under a new section, namely sect. *Lamprocarpa* Maassoumi. But the correctness of this treatment has been questioned (ZARRE 2000) because of paraphyletic nature of such a classification.

Astragalus sect. *Acanthophaea* is closely related to *A.* sect. *Megalocystis* Bunge and sect. *Adiaspastus* Bunge. *A. lalesarensis* Bornm. plays a transitional role between all three sections. Vegetative form and shape of petals in this species are very similar to *A. hezarensis* (sect. *Acanthophaea*), while its red colored and inflated fruiting calyx reminds one of *A. murinus* (sect. *Megalocystis*). Moreover, it is similar (and most probably closely related) to *A. sahendi* (sect. *Adiaspastus*) in many respects. The appearance of paraclades on short lateral branches at the base of each leaf is a rare character in the thorny *Astragali* which is developed in *A. sclerocladus* of sect. *Acanthophaea*. This character occurs otherwise in sect. *Poterion* Bunge, which is also more or less a basal group within the thorny *Astragali* (see ZARRE 2000).

This study is mainly based on herbarium material. Several sheets have been examined for each species, received on loan from the following herbaria (abbreviations according to HOLMGREN & al.): B, BM, E, G-BOIS, G-DC, JE, K, M, M, P, IRAN, TARI, TUH, UPS, US, W and WU. Moreover, during several excursions in Iran, some of the species were studied in the field by one of the authors (ZARRE). Flower dissections were made from several specimens and added to the sheets after examination.

Taxonomic Account

Astragalus L sect. *Acanthophaea* Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 45. 1868. Lectotype (DEML 1972): *A. schistocalyx* Bunge.
= *A.* sect. *Lamprocarpa* Maassoumi, Iran. J. Bot. 6: 199. (1994) 1995. Type (monotypic): *A. lamprocarpus* Maassoumi.

Subshrubs or cushion-forming plants, loosely or densely branched at base. Caudex up to 3 cm in diam., greyish brown to black. Hairs mostly flattened and ribbon-like, papillose on surface, white in vegetative parts, mixed with grey and black ones in the inflorescences. Stipules chartaceous, yellowish-white, adnate to petiole for ca. 1/3–1/2 of their length, otherwise free from each other or only shortly connate at the base, triangular-ovate, the free acute tips with only one main nerve. Leaves paripinnate; rachides thick and rigid, hairy, whitish green; leaflets ± thick, mostly small, green or greyish green, hairy, mostly soon glabrescent, sometimes completely glabrous. Inflorescences lateral, few–10-flowered racemes. Peduncle shorter than leaves, appressed hairy. Bracts chartaceous, with one main nerve. Bracteoles sometimes present, adnate to the calyx, singular or in pairs. Pedicels up to 2.5 mm long. Calyx tubular, chartaceous, with 14–16 parallel indistinct longitudinal, thin nerves, sparsely to densely hairy, ruptured by the pod; teeth subulate. Corolla pink to purple or bluish to violet, more rarely creamy to yellowish, claw of wings and keel only at base adnate to staminal tube. Standard (10–)12–28 mm long, not sharply differentiated into claw and blade, constricted at the middle, lower half narrower than upper. Wings slightly shorter than standard, blade narrowly oblong to narrowly obovate, claw as long as or longer than blade. Keel slightly shorter than wings, blades obovate-triangular, with widely to rectangular-curved lower edge and ± straight upper edge. Ovary shortly stipitate, hairy; style hairy at the base or in lower half. Fruits bilocular, or only in *A. hezarensis* and *A. ovigerus* unilocular, laterally or

dorsi-ventrally compressed, elliptic-oblong to ovate-elliptic or widely elliptic. Seeds olive green to brown with black spots, rugose on surface, elliptic-kidney-shaped.

Diagnostic key to the species of *Astragalus* sect. *Acanthophaea*

1. Short lateral shoots present at the base of each leaf on the main stem though irregularly; paraclades borne on the short lateral shoots; calyx hairs exclusively white
 8. *A. sclerocladus* Bunge
- Short lateral shoots absent; paraclades borne directly on the main stem; calyx hairs white and black, only in *A. lycioides* some specimens with exclusively white hairy calyx 2
2. Ovary and fruits unilocular; mature fruits 15–38 mm long 3
- Ovary and fruits bilocular; mature fruits 7–15 mm long 4
- Mature fruits 15–18 mm long; leaflets 5–7 pairs; calyx greyish green to creamy
 5. *A. hezarensis* Zarre & Podlech
- Mature fruits 30–38 mm long; leaflets 7–10(–15) pairs; calyx often flushed with red
 7. *A. ovigerus* Boiss.
4. Young stems ± glabrous; stipules glabrous or only at margins ciliate 5
- Young stems densely hairy; stipules hairy all over 7
5. Bracts linear-subulate, 1.5–2.5 mm long and 0.5–1 mm wide
 9. *A. stenostegius* Boiss. & Hausskn.
- Bracts ovate, 2–4 mm long and 1.5–2.5 mm wide 6
6. Leaflets in 4–9 pairs, sparsely to loosely covered on underside with ascending hairs; bracts 2–4 mm long; calyx sparsely to loosely covered with ascending white and black hairs; standard 12–17 mm long; legumes 8–12 mm long
 4. *A. horridus* Boiss.
- Leaflets in 6–11 pairs, glabrous or with few appressed hairs at the midvein; bracts 1–2.5 mm long; calyx very sparsely covered with strongly appressed black hairs; standard 16–21 mm long; Legumes 6–7 mm long
 1. *A. cryptocarpos* DC.
7. Calyx teeth 1/2–1/1 as long as the tube; standard 11–14 mm long
 3. *A. hemsleyi* Aitch. & Hemsl.
- Calyx teeth 1/5–1/3 as long as the tube; standard 14–25 mm long 8
8. Fruits laterally compressed, 2–3 mm wide; young rhachides dense. Standard glabrous
 6. *A. lycioides* Boiss.
- Fruits dorsi-ventrally compressed, 5–9 mm wide; young rhachides remote. Standard hairy along the midline on dorsal surface
 2. *A. cystosus* Zarre & Podlech

The species

- Astragalus cryptocarpus* DC., Astragal.: 187. 1802. Holotype: "Tragacantha orientalis humillima foliis viciae, costae purpureae innascentibus, Tournefort cor. 29, Armenia" (P (hb. Vaillant!; iso: G-DC!, LE (fragm.)! [all without flowers and fruits]. Epitype (here designated): Turkey, [B9 Bitlis] Hanemir Da, N Seite von Oboskü Köyü aus, 2320 m, 10.8.1987, *Engel 108a* (MSB!).
- = *Astragalus rechingeri* Sirj., Ann. Naturhist. Mus. Wien 49: 269. 1939. Holotype: Kurdistan, Aghérov Da. (S der Ebene von Pesandasht, 2900 m, 24.6.1936, *Frödin 77* (UPS!: photo K; iso: W!: photo MSB!).

Dwarf cushion-forming shrublets, 15–20 cm tall, densely branched at the base, mostly very sparsely furnished with white and black hairs 0.2–1 mm long. Stems from a prostrate base ascending, older parts without remnants of last years stipules and rachides, parts of the current year 1–6 cm long, in first year 1–2.5 mm diam., glabrous below stipules. Stipules whitish, chartaceous, 3–6 mm long, adnate to the petiole for 2–3 mm, otherwise free from each other, triangular- acuminate, glabrous or sometimes with few hairs at the margins. Leaves 1.4–7 cm long; rachides crowded, \pm thin, flexible, straight or curved, glabrous or with few appressed white hairs; terminal spine 1/3–1/1 as long as the uppermost leaflets; petiole 0.6–2.2 cm long (ca. 1/3–1/2 as long as rhachis). Leaflets in 6–11 pairs, green, 3–8 \times 0.7–1.5 mm, narrowly oblong, or rarely narrowly obovate, mostly folded, at the apex acute or obtuse, minutely mucronulate, glabrous or on underside with few appressed hairs at the midrib. Peduncles 0.2–0.5 cm long, sparsely covered with some black or rarely mixed with white, \pm spreading hairs. Racemes loosely 2–5-flowered; flowering axis 0.2–0.5 cm long. Bracts chartaceous, whitish, 1–2.5 mm long and 0.5–1 mm wide, narrowly triangular-acuminate, deciduous, glabrous or sometimes with few tubercle-based hairs at margins. Pedicels 1–2 mm long, with few subappressed black hairs. Bracteoles absent. Calyx dark grey or brownish becoming creamy, tubular, ruptured by the pod, 6.5–10 mm long and 1.5–3.5 mm diam., very sparsely covered with strongly appressed black hairs, at the teeth more densely hairy and with some white hairs mixed in; teeth (1.5–)3 mm long, subulate. Petals pinkish-white, keel sometimes with bluish violet blades. Standard 16–21 mm long and 5–8 mm wide, without clearly differentiated claw, oblong, shallowly constricted at middle, lower part as wide as the upper part, retuse at the apex. Wings 14–18 mm long; blade narrowly oblong, at the apex obtuse or very minutely mucronulate, 6.5–10 \times 2–3 mm; auricle 0.7–1 mm long, claw 8.5–9 mm long. Keel 13–15 mm long; blades ovate-oblong or rarely elliptic, 5–6 \times 2.5–3 mm; claw 8.5–9 mm long. Ovary very shortly stipitate, densely sericeous except for base, ventral and dorsal edges; style glabrous. Legumes shortly stipitate, obliquely elliptic with straight ventral edge and strongly curved dorsal edge, 6–7 mm long, 2.5–4 mm wide and 3–5.5 mm high, laterally compressed, with a straight beak 0.5–1 mm long, bilocular; valves sparsely appressed hairy, becoming glabrous. Seeds immature, single in each locule.

Distribution: E Turkey.

Specimens seen:

Turkey: Prov. Bitlis/Van: mt. 10 km SE Pelli, 2450 m, 8.7.1954, *Davis & Polunin D.22582* (BM, E). – Prov. Van: distr. Satak, Kavussahap Dag, 2750 m, 27.7.1954, *Davis & Polunin D.23075* (BM, E) – Tatvan to Geva, Kusgunkiran Geçidi, 2250 m, 11.8.1987, *Engel 110* (MSB).

Note: The type material of *A. cryptocarpus* both in G-DC and P consists only of some sterile shoots, without flowers and fruits. That is the reason why this species was treated as doubtful by BUNGE (1867/68) and BOISSIER (1872). The original description was most probably prepared on the basis of a poor specimen with only one flower and pod. Since the type material associated with this name is ambiguous, it was necessary to select an epitype (see GREUTER & al. 1994, article 9.7) congruent with the original description and material of this name.

After typification it became clear that *A. rechingeri* must be reduced to synonymy under this species. The latter was treated as a member of sect. *Acanthophaea* in Flora of Turkey by CHAMBERLAIN & MATTHEWS (in DAVIS, Flora of Turkey 1970) and has been transferred into sect. *Acidodes* Bunge (a synonym of sect. *Adiaspastus* Bunge, see ZARRE 2000) by DEML (1972). The type material of *A. rechingeri* is a young plant without any mature pod. But the new collections of this species by Engel near the type locality confirmed that this species has bilocular fruits, and therefore belongs to the sect. *Acanthophaea* sensu DEML (1972) and not to sect. *Acidodes*. Bilocular pods with only one seed in each locule and almost glabrous leaves and stipules are the features which were cited as characteristic in the original descriptions of both *A. cryptocarpus* and *A. rechingeri*. Moreover, there is no other species of *A. sect. Acanthophaea* distributed in Turkey. Therefore, the synonymy of *A. rechingeri* under *A. cryptocarpus* is well confirmed.

The type material of *A. rechingeri* as well as other specimens belonging to *A. cryptocarpus* show the indumentum type typical for *A. sect. Acanthophaea*: the hairs are appressed, ribbon-like and densely papillose. As it was mentioned recently (ZARRE 2000), such indumentum is also characteristic for subtribe *Coluteinae* of the tribe *Galegeae*.

Astragalus cystosus Zarre & Podlech, spec. nov.

Holotype: Iran, Prov. Khorassan, Montes Yoghatay in declivibus 25 km N Sabzevar, 1500–1600 m, 16.6.1975, *K.H. Rechingeri 53642* (M!; iso: W!).

Figure: Fig. 1.

Valde affinis *A. lycioides* sed differt leguminis dorsi-ventraliter (nec lateraliter) compressis, 5–9 mm (nec 2–3 mm) latis et rhachidibus remotis (nec densis).

Fruticulosus, spinosus, 15–35 cm altus, pilis subbasifixis, albis nigrisque 0,1–1,5 mm longis. Stipulae chartaceae, 1–4 mm longae, triangulares. Folia 1,3–6,5 cm longa; rhachides ± remotae, dense sericeae. Foliola 4–9 juga, 1–4 mm longa et 2–5 mm lata, obovata, retusa, appresse sericea. Racemi pedunculo 0,3–2,2 cm longo, dense appresse pilosi suffulti, laxe 2–6 (–9)-flori. Bracteae chartaceae, anguste triangulares, 1–2 mm longae, dense appresse pilosae. Pedicelli ca. 2 mm longi. Bracteoleae saepe evolutae, minutae. Calyx tubulosus, flavidirubellus, 8–13 mm longus, sparse ad dense appresse pilosus. Petala rosea ad violacea.

Vexillum 16–25 mm longum et 5–9 mm latum. Legumina coriacea, bilocularia, valde inflata, dorsi-ventraliter compressa, 10–15 mm longa et 5–9 mm lata.

Dwarf spiny subshrubs, 15–35 cm tall, densely or rarely loosely branched at the base, furnished with mostly flattened and ribbon-like, in vegetative parts white, in inflorescences mostly also black hairs 0.1–1.5 mm long. Stems 1.5–2.5 mm in diam. in first year, densely appressed hairy, gradually glabrescent. Stipules chartaceous, yellowish, mostly reflexed from the middle, 1–4 mm long, adnate to the petiole for ca. 1/2–2/3 their length, triangulate or ± oblong-acuminate, densely hairy, partly glabrescent. Leaves 1.3–6.5 cm long; rhachides ± remote, thin, rigid, densely hairy or partly glabrescent, terminal spine 2–5 times as long as the uppermost leaflets; petiole ca. 1/3 as long as the rhachis. Leaflets in 4–9 pairs, mostly complicate, rarely flattened, greyish green to green, 1–4 × 1–2.5 mm, obovate, at the apex shallowly retuse, on both sides sparsely to densely appressed hairy, partly glabrescent. Peduncles 0.3–2.2 cm long, densely appressed hairy. Racemes loosely 2–6(–9)-flowered. Bracts narrowly triangular, 1–2 mm long, chartaceous, densely appressed hairy. Pedicels ca. 2 mm long, appressed hairy. Bracteoles mostly present at the base of calyx, single or rarely in pairs, ca. 1 mm long, subulate, hairy. Calyx yellowish, sometimes flushed with red, 8–13 mm long and 2–3 mm in diam., sparsely to densely covered with appressed or rarely ascending hairs; teeth 1.5–3 mm long, mostly unequal, subulate. Petals pink to violet. Standard hairy on midrib at the dorsal-abaxial surface, 16–25 mm long and 5–9 mm wide, without sharply differentiated claw, ± elliptic-pandurate, shallowly constricted at the middle, at the apex retuse. Wings slightly shorter than standard; blade narrowly oblong, obtuse at the apex, 7–9 × 2 mm; auricle 0.5–0.8 mm long. Keel 14–19 mm long; blades 5.5–8 × 2–2.5 mm. Legumes with a stipe ca. 1 mm long, 10–15 mm long, 5–9 mm wide and 3–6 mm high, dorsi-ventrally compressed, bilocular; valves coriaceous. Seeds 4–12.

Distribution: NE Iran.

Specimens seen:

Iran. Prov. Khorasan: Esfarayen versus Sabzevar, 20 km from Sabzevar, 1600–1700 m, 27.6.1975, *Termeh s.n.* (IRAN) – Montes Yoghatay in declivibus 25 km N Sabzevar, 1500–1600 m, 16.6.1975, *Rechinger 53642* (M, W).

Note: The material described here as the new species “*A. cystosus*” was attributed to *A. pseudoangustifolius* Sirj. & Rech.f. by MAASSOUMI (1995). Although the specimen cited as the reference for such a treatment (*Assadi & Mozaffarian 35753* in TARI) was also collected from Kuh-e Bizg, like *A. pseudoangustifolius*, it differs in some respects from the type material of the latter species. The most important difference in vegetative parts between *A. cystosus* and the type of *A. pseudoangustifolius* is the loose habit of the former and its remotely positioned rhachides. Since the type material of *A. pseudoangustifolius* is young and lacks any fruit, an epitype was selected for this specimen (see under *A. lycioides*). This epitype falls in all respects, especially with its laterally compressed fruits, within the variability of *A. lycioides*. Therefore, *A. pseudoangustifolius* is reduced here to synonymy under *A. lycioides*. So, there was no name for the species with largely inflated and dorsi-ventrally compressed fruits and it is therefore newly described here.

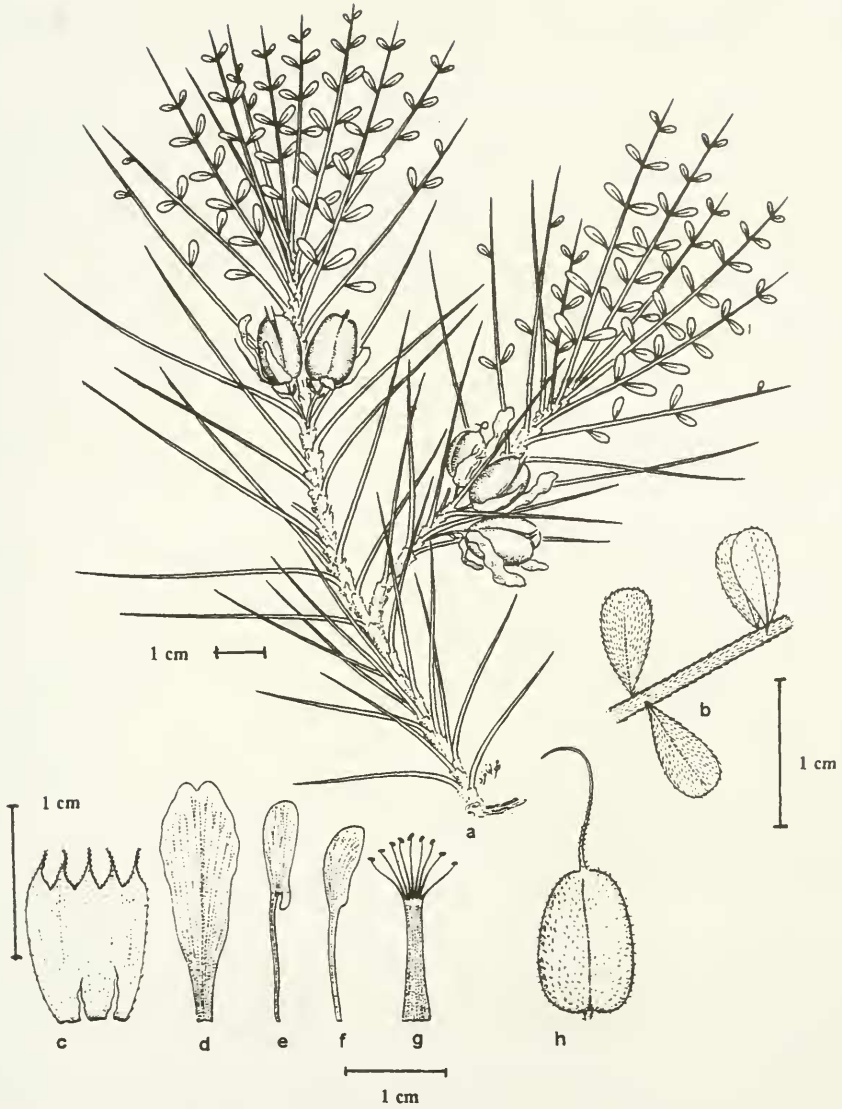


Fig. 1. *Astragalus cystosus* (after Termeh s.n.): – a: the whole plant, b: rhachis segment with leaflets, c: calyx, d: standard, e: wing, f: keel, g: staminal tube, h: fruit.

Astragalus hemsleyi Aitch. & Baker, J. Linn. Soc., Bot. 19: 158. 1882 \equiv *A. canispinus* Boiss., Fl. Or. Suppl.: 181. 1888, illeg. [homotypic with *A. hemsleyi*]. Syntypes: [Afghanistan] Hariab District, 1880, *J.E.T. Aitchison 61/80*; dto., Sergal to Biankhel, 5.6.1879, *J.E.T. Aitchison 1215* (K!). Lectotype (ALI 1961): Hariab District, Afghanistan, 1880, *J.E.T. Aitchison 80* (K!; iso sub 61/80: BM!, C!, G-BOIS!, K!, LE!, P!).

Figures: RECHINGER, K.H.: *Symbolae Afghanicae* 3 – Biol. Skr. 9(3): Fig. 131, 132. 1957;
 DEML, I.: Revision der Sektionen *Acanthophaea* Bunge und *Aegacantha* Bunge der Gattung
Astragalus L. – *Boissiera* 21: p. 185, 186, figs. 1, 2 & 25. 1972.

Dwarf spiny subshrubs, 15–25 cm tall, densely or rarely loosely branched at the base with white, only in the calyx also with greyish-black hairs 0.1–0.6 mm long. Stem 1.5–2.5 mm diam. in first year, densely appressed sericeous, gradually glabrescent. Stipules chartaceous, yellowish, 2–4 mm long, adnate to the petiole for ca. 1/2 of their length, triangular or ± oblong-acuminate, sparsely hairy, soon glabrescent, ciliate at margins. Leaves 2–5 cm long; rachides ± dense, thin, rigid, densely hairy, glabrescent with age; terminal spine 2–4 times as long as the uppermost leaflets; petiole ca. 1/5–1/3 as long as the rachis. Leaflets in 6–9 pairs, slightly complicate or flat, greyish green to green, 1–3 × 1–2 mm, widely obovate to nearly orbicular, shallowly retuse at the apex, on upper side glabrous, on underside sparsely adpressed hairy, especially at midvein and margins. Peduncles 0.1–0.2 cm long, hairy. Racemes loosely 2–4-flowered. Bracts chartaceous, narrowly triangular, 1–2 mm long, appressed hairy. Pedicel 1–2.5 mm long, hairy. Bracteoles sometimes present at the base of calyx, single or rarely in pairs, 0.2–1 mm long, subulate, hairy. Calyx yellowish-white, mostly flushed with red, 6–9 mm long and 2–3 mm in diam., sparsely to densely covered with appressed to spreading hairs; teeth 2–4.5 mm long, mostly unequal, subulate. Petals pink to red. Standard 10–14 mm long and ca. 5 mm wide, without sharply differentiated claw, ± elliptic-pandurate, shallowly constricted at middle, retuse at the apex. Wings slightly shorter than standard; blade narrowly oblong, obtuse at the apex, 5–6.5 × 2 mm; auricle 0.3–0.4 mm long. Keel 9–10 mm long; blades ca. 4–5 × 2 mm. Legumes with a stipe ca. 0.5 mm long, narrowly elliptic, ca. 8 mm long and 3.5 mm high, laterally compressed, bilocular; valves coriaceous, ± densely covered with appressed to ascending hairs. Seeds 3–8.

Distribution: Afghanistan and Pakistan.

Specimens seen:

Afghanistan. Prov. Paktia: Latakary Pass zwischen Alikhel und Dobandi, 3300 m, 5.7.1991, *Volk 71/489* (MSB) – oberhalb Qasim Khel, 3250 m, 24.6.1969, *Freitag 5772* (Hb. Freitag) – Hariab District, 1880, *Aitchison 61/80* (BM, G-BOIS, K, LE, P) – Sergal to Biankhel, 5.6.1979, *Aitchison 1215* (K).

Pakistan. Kurram: in valle Kurram, 2700–3000 m, *Harsukh 14830* (E). – Quetta: Urak-Tal, 12 Meilen W. Quetta, V.1958, *Repp* (W) – Ziarat, 2440 m, 18.5.1989, *Lace* (E). – Kalat: in monte Harboi pr. Kalat, 2700 m, *R.R. Stewart 772* (E).

?: Surkai Zangy, 19.5.1956, *Peddie 124* (K).

Note: This species is endemic around the Afghanistan-Pakistan border. Another thorny species of *Astragalus* which shows a similar distribution pattern is *A. diopogon* from sect. *Megalocystis*. Since the fruits of the latter sometimes rupture the calyx (see TIETZ & ZARRE 1994), a feature characterizing *A.* sect. *Acanthophaea*, it can be confused with *A. hemsleyi*. However, the exclusively white hairy calyx of *A. diopogon* (in contrast to the white and black hairy one in *A. hemsleyi*) and its relatively large bracts (3–9 mm, against 1–2 mm in *A. hemsleyi*) can be used as diagnostic characters for separating them.

Astragalus horridus Boiss., Diagn. pl. orient., ser. 2, 2: 66. 1843 \equiv *Tragacantha horrida* (Boiss.) Kuntze, Revis. Gen. 2: 945. 1891. Syntypes: Asia minor, *Aucher* 1253 (P!); Persia prope Ispahan, *Aucher-Eloy* 1280; Persia occidentali., *Aucher-Eloy* 1281 (G-BOIS!: photo M!, K!: foto M!, P!); [Iran] in montibus Ghilani, *Aucher-Eloy* 4394 (LE!, P!). Lectotype (DEML 1972): Persia prope Ispahan., *Aucher-Eloy* 1280 (G-BOIS!: foto MSB!; iso: G!, K!: foto M!, LE!, OXF!, P!).

= *A. chionobius* Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11 (16): 46. 1868 [et l.c. 15(1): 74. 1869] \equiv *Tragacantha chionobia* (Boiss.) Kuntze, Revis. Gen. 2: 944. 1891. Lectotype (PODLECH 1998): Persia, Kuh-Delu, 10.6.1842, *Kotschy* 474 (P!: foto MSB!; iso: G!, G-BOIS!: foto MSB, K!, M!, P!, ZT!).

= *A. chionobius* var. *hirtus* Boiss., Fl. Or. 2: 313. 1872. Lectotype (PODLECH 1998): [Iran] Esfahan, ad nives Kellal et Sebse Kuh, 1868, *H.C. Haussknecht* (G-BOIS!; iso:G!, K!, W!).

Figures: DEML, I.: Revision der Sektionen *Acanthophaece* Bunge und *Aegacantha* Bunge der Gattung *Astragalus* L. – Boissiera 21: p. 183, 186, Fig. 9–12, 16, 17, 22, 23. 1972.

Dwarf spiny subshrubs, 15–35 cm tall, densely or loosely branched at the base with in vegetative parts white, in the inflorescences mostly also with black hairs 0.1–1 mm long. Stems 1.5–3 mm diam. in first year, glabrous. Stipules membranous, yellowish-white, 3–6 mm long, adnate to the petiole for ca. 2/3 of their length, partly or completely clasping the stem, mostly ovate-acuminate, ciliate at margins and tip, glabrous otherwise. Leaves 1.7–6.5 cm long; rachides \pm dense, thin, rigid, sparsely to loosely furnished with appressed to ascending hairs, glabrescent with age; terminal spine 2–5 times as long as the uppermost leaflets; petiole ca. 1/3 as long as the rachis. Leaflets in 4–9 pairs, slightly complicate to flat, green, 3–7 \times 1–2.5 mm, narrowly obovate, acutish to shallowly retuse at the apex, on upper side hairy only at the margins, on underside very sparsely to loosely furnished with ascending hairs. Peduncles 0.2–0.7 cm long, appressed hairy. Racemes loosely 4–9-flowered. Bracts whitish, membranous, 2–4 mm long and 1.5–2.5 mm wide, ovate, sparsely hairy. Pedicels 1–2 mm long, hairy. Bracteoles sometimes present, at the base of calyx, single or rarely in pairs, 1–2.5 mm long, ciliate. Calyx yellowish, mostly flushed with red, 7–12 mm long and 2–5 mm in diam., sparsely to loosely covered with appressed to ascending black and white hairs; teeth 1.5–3(–4) mm long, mostly unequal, subulate or linear. Petals pink to purple. Standard 12–17 mm long and 4.5–7 mm wide, without clearly differentiated claw, elliptic to \pm elliptic-pandurate, sometimes shallowly constricted at middle, retuse at the apex. Wings 11–15 mm long; blade narrowly oblong, obtuse at the apex, 5.5–7 \times 2 mm wide; auricle ca. 0.5–0.8 mm long. Keel 10–14 mm long; blades \pm semicircular, with widely curved lower edge and straight upper edge, 4–6 \times 2–2.5 mm. Ovary densely hairy. Legumes with a stipe 0.5–1 mm long, narrowly elliptic, 8–12 mm long and 3–4 mm high, laterally compressed, bilocular; valves coriaceous. Seeds 4–8.

Distribution: C, W and SW Iran.

Specimens seen:

Iran. Prov. Boyer Ahmadi (Kohgiluyeh): Kuh Dena, 3600 m, ix.1955, *Remaudière* 5242 (IRAN). – Prov. Chahar Mahal Bakhtiari: Zard-Kuh, above Kuhrang valley, 4265 m, 5.8.1966, *Archibald* 2957 (E, K) – Zard Kuh, 3500–4000 m, 10.8.–3.9.1975, *Carls* (W) – Gandomkar,

Kuh-e Garreh, 2300–2700 m, 9.6.1973, *Iranshahr & Moussavi 15557* (IRAN, W) – Ardal, Zard Kuh, 2700–3200 m, 14.–15.6.1973, *Iranshahr & Moussavi 15599* (W) – Kouhrang Dam, versus Sarcheshmeh Karoun, 2300–2400 m, 18.6.1973, *Iranshahr & Moussavi 15603* (IRAN, W) – Dul-Kala, near Kuhrang, c. 2500 m, 7.6.1966, *Zhumer 1035* (BG). – Prov. Esfahan: prope Ispahan, *Aucher-Eloy 1280* (G, G-BOIS, K, LE, OXF, P) – Qashqai region, Kuh-e Surmandeh (Kuh-e Alijuq), Semirom, in declivibus boreo-orientalibus, 2700–3900 m, 7.6.1974, *Rechinger 47550* (M, W). – Prov. Fars: Kuh-Delu, 10.6.1842, *Kotschy 474* (G, G-BOIS, K, M, P, ZT). – Prov. Lorestan: in mte. Schuturunku, VII.1908, *Strauss* (B) & VIII.1903, *Strauss* (B, K). – Prov. Markazi: Sultanabad, in monten Raswend, 15.7.1892, *Strauss* (B) – dto., VIII.1899, *Strauss* (B) – *ibid.*, 26.7.1903, *Strauss* (B) – dto., 4.7.1909, *Strauss* (B). – Not traced: Djoubulak, IX.1898, *Strauss* (B).

Note: *A. horridus* is endemic to the central Zagros mountain range. Membranous stipules are one of the important diagnostic characters of this species, a character which relates it to *A. chartostegius* Boiss. & Hausskn. of *A. sect. Adiaspastus*. Interestingly, the latter is also distributed over the same area, though more frequent. The bilocular ovary and fruit of *A. horridus* (against the unilocular one in *A. chartostegius*) is an important feature which can be used for separating them.

The specimen *Rechinger 47550* differs from other examined material in having spreading-hairy leaves. Moreover, the type of indumentum on calyx shows a considerable variability in this species: some specimens have spreading-hairy calyx and other appressed ones. A similar situation we have regarding *A. lycioides* with respect to *A. schistocalyx*.

The specimen *Iranshahr & Moussavi 15603* differs from other specimens in having a yellowish white corolla and calyx. It is most probably only an albino morph and cannot represent a new taxon.

Astragalus hezarensis Zarre & Podlech, spec. nov.

Holotype: Iran, Prov. Kerman, Kuh-e Hezar, 20 km SW Rayen, NE ridge leading to summit, 3800 m, 1.6.1977, *J.R. Edmonson & A.G. Miller 1574* (W!; iso: E!).

Figures: fig. 2.

Affinis *A. ovigero* sed differt leguminis brevioribus, 15–18 mm (nec 30–38 mm) longis, foliolis 5–7 jugis (nec 7–10 jugis) et calyce griseo-viridi vel lacteo (nec rubello); ab *A. lalesarensis* (sect. *Megalocystis*) pilis albi-nigrisque (nec tantum albis) obtectus et calyce griseo-viridi vel lacteo (nec rubello); ab *A. sahendii* (sect. *Adiaspastus*) stipulis 5–8 mm (nec 13–17 mm) longis, foliolis 1.5–6 mm (nec 13–17 mm) longis, bracteis 3–4 mm (nec 7–10 mm) longis et leguminibus 11–18 mm (nec 9–11 mm) longis.

Plantae suffruticosae, 15–25 cm altae, pilis basifixis albi-nigrisque, 0,5–1,5 mm longis instructae. Stipulae chartacae, 5–8 mm longae, late ovatae, ciliatae. Folia ad 5,5 cm longa. Foliola 5–7-juga, ad 6 mm longa et 3 mm lata, obovato-elliptica, plerumque plana, sparse ad dense appresse sericea. Racemi pedunculo 0,3–1 cm longo suffulti, laxe 1–2-flori. Bractee membranaceae, 3–4 mm longae et ca. 1,5 mm latae. Bracteoleae minutae. Calyces 11–15 mm longi et 3–5 mm diam., pilis patentibus densiter obtecti, dentibus 2–3 mm longis. Vexillum

22–27 mm longum et 9–12 mm latum. Legumina a latere compressa, coriacea, 11–18 mm longa et 5–8 mm alta, unilocularia.

Dwarf spiny subshrubs, 15–25 cm tall, \pm loosely branched at base, with mostly flattened, rarely cylindrical, acute white or in the inflorescences mostly also with black hairs 0.1–1.5 mm long. Stems 1–3 mm diam. in first year, densely appressed hairy, soon glabrescent. Stipules chartaceous, yellowish-white, 5–8 mm long, adnate to the petiole for 1/2–2/3 of their length, widely ovate, shortly acuminate, ciliate at margins and tip, glabrous otherwise. Leaves 1.1–5.5 cm long; rhachides \pm dense, thick, rigid, densely appressed hairy, later on partly glabrescent; terminal spine 1/3–1/10 as long as the uppermost leaflets; petiole 1/3–1/2 as long as the rhachis. Leaflets in 5–7 pairs, \pm flat, greyish green, 1.5–6 \times 1–3 mm, obovate to elliptic, at the apex obtuse, with a minute mucro 0.2–0.8 mm long, on upper side \pm glabrous, on underside sparsely to loosely appressed hairy, soon glabrescent. Peduncles 0.3–1 cm long, densely hairy. Racemes loosely 1–2-flowered. Bracts \pm membranous, 3–4 mm long and ca. 1.5 mm wide, narrowly triangular, sparsely hairy. Pedicels 2–3 mm long, hairy. Bracteoles 1.5–2.5 mm long, subulate. Calyx greyish green, sometimes obliquely gibbous at the base, 11–15 mm long and 3–5 mm diam., rather densely covered with spreading hairs; teeth 2–3 mm long, mostly unequal, from a triangular base subulate. Petals white (yellow when dried), keel with purple blades. Standard 22–27 mm long and 9–12 mm wide, without sharply differentiated claw, \pm obovate-elliptic, shallowly retuse at the apex. Wings 18–24 mm long; blade narrowly oblong-elliptic, obtuse at the apex, 9–13 \times 2.5–4 mm; auricle ca. 0.6–1 mm long. Keel 15–19 mm long; blades oblong-obovate, 7–8 \times 4 mm. Ovary shortly stipitate, style hairy in lower third. Legumes shortly stipitate, narrowly oblong-elliptic, 11–18 mm long and 5–7 mm high, laterally compressed, with a beak 2–3 mm long, unilocular; valves sparsely to densely hairy. Distribution: S Iran (only known from Hezar mountains around Kerman).

Specimens seen:

Iran. Prov. Kerman: Kuh-e Hezar, 20 km SW Rayen, NE ridge leading to summit, 3800 m, 1.6.1977, *J.R. Edmonson & A.G. Miller 1574* (E, W) – Raien, Gharieh-ye Mir-Shady, Kuh-e Hezar, 3000–3450 m, 21.5.1976, *Moussavi 35026* (IRAN, W).

Note: *A. hezarensis* is closely related to *A. lalesarensis* which has been treated as a member of *A. sect. Megalocystis* (see TIETZ & ZARRE 1994). No fruiting specimen of *A. lalesarensis* was available to the earlier authors and it is possible that its fruit is also similar to those of *A. hezarensis*. However, the calyx in *A. lalesarensis* is distinctly inflated (a feature characteristic of *A. sect. Megalocystis*). *A. hezarensis* is a narrowly endemic species which occurs in the same area as *A. lalesarensis*. The possession of white-hairy, inflated calyces contrary to black and white hairy, non-inflated calyces separates *A. lalesarensis* from *A. hezarensis*. The close relationship between these species is another evidence for affinity of *A. sect. Acanthophaea* and *A. sect. Megalocystis*. Most probably *A. sect. Megalocystis* originated several times from earlier species of *A. sect. Acanthophaea* and is therefore polyphyletic.

A. hezarensis is also very closely related to *A. saheni* of *A. sect. Adiaspastus* (for a detailed description see ZARRE, 2000), but differs from it in having shorter stipules and larger fruits. Moreover, *A. hezarensis* has papillose hairs, against *A. saheni* with striate hairs. Additionally, the fruits, stipules and bracts of *A. saheni* are larger than those of *A. hezarensis*.

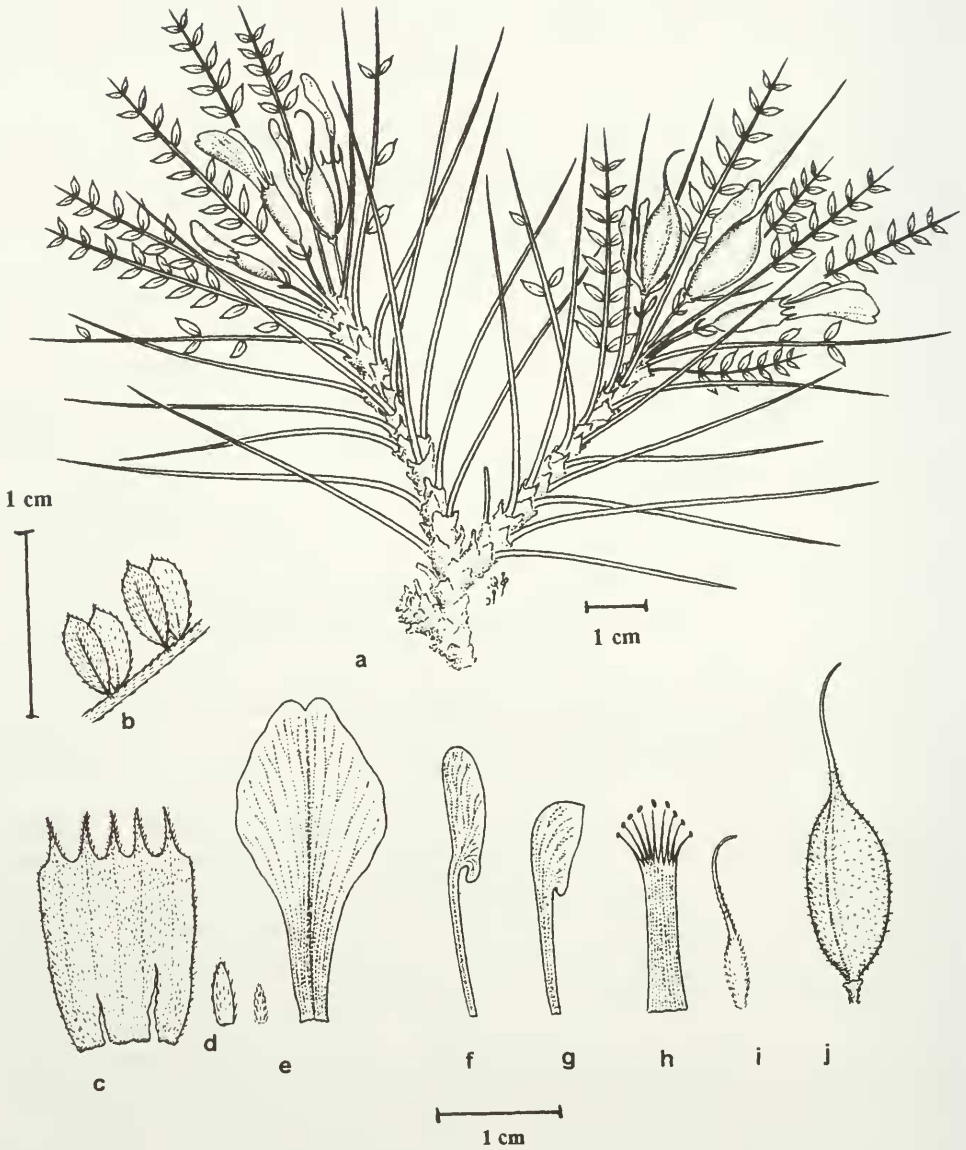


Fig. 2. *Astragalus hezarensis*: - a: the whole plant, b: rhachis segment with leaflets, c: calyx, d: bracts, e: standard, f: wing, g: keel, h: staminal tube, i: ovary, j: fruit. - After *Moussavi 35026 (IRAN)*.

- Astragalus lycioides* Boiss., Diagn. pl. orient., ser. 1, 2: 66. 1843 \equiv *Tragacantha lycioides* (Boiss.) Kuntze, Revis. Gen. 2: 946. 1891. Holotype: Persia prope Isfahan, *Aucher-Eloy* 1270 (G-BOIS!: foto M!; iso: G!, K!, P!).
- = *A. dendridium* Fisch., Bull. Soc. Imp. Naturalistes Moscou 26(2): 427. 1853. Syntypes: M. Sufi pr. Isfahan, *G. Kapherr* (H!); in M. Korud pr. Isfahan, *Bode*. Lectotype (designated here): in m. Korud pr. Isfahan, *Bode* (LE!; iso: G-BOIS!: foto MSB!).
- = *A. leptacanthus* Fisch., Bull. Soc. Imp. Naturalistes Moscou 26(2): 432. 1853 \equiv *Tragacantha leptacantha* (Boiss.) Kuntze, Revis. Gen. 2: 946. 1891. Type: Persia, prope Ssof N Isfahan, 22.5.1847, *F.A. Buhse 1450* (iso: G!, G-BOIS!: foto M!).
- = *A. schistocalyx* Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 46. 1868 [et l.c. 15(1): 75. 1869]. Syntypes: inter Nischapur et Mesched prov. Chorassan Persiae, fr. 13.7.1856 *A. von Bunge & T. Bienert* (L!, LE!, P!); fl. 12.6.1858, *A. von Bunge & T. Bienert*. Lectotype (PODLECH, 1998): [Iran] inter Nischapur et Mesched prov. Chorassan Persiae, fl., 12.6.1858, *A. von Bunge & T. Bienert* (P!; iso: G-BOIS!, GOET!, K!: photo M!, P!, W!).
- = *A. syrtschensis* Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 46. 1868 [et l.c. 15(1): 74. 1869]. Lectotype (designated here): [Iran] Syrtsch inter Chäbbis et Kerman, iv.1859, *A. von Bunge & T. Bienert* (P!; iso: G-BOIS!, GOET!, K!: foto MSB!, L!, LE!, M!, P!: photo M!, W!).
- = *A. schistocalyx* var. *bizgimontanus* Sirj. & Rech.f., Ann. Naturhist. Mus. Wien 58: 63. 1951. Holotype: [Iran] Khorasan, in Monte Kuh-e Bizg, 2000 m, *E. Gauba & Mirdamadi 527* (W!). Epitype (designated here): Iran, prov. Khorasan: in monte Kuh-e Bizg, 4.–6.7.1937, *K.H. Rechinger 1442* (W!).
- = *A. pseudoangustifolius* Sirj. & Rech.f., Anz. Österr. Akad. Wiss., Math.-Naturwiss. Kl. 90: 119. 1953. Holotype: [Iran] Khorasan, Kuh-e Bizg near Turbat-e Shaik Djam, 17.6.1885, *J.E.T. Aitchison 666* (C!; iso: K!, P!: photo M!, W!). Epitype (designated here): Iran, prov. Khorasan: in monte Kuh-e Bizg, 4.–6.7.1937, *K.H. Rechinger 1442* (W!).

Figures: FISCHER, F.B.: “Synopsis *Astragalorum Tragacantharum*” – Bull. Soc. Imp. Naturalistes Moscou 27, tab. J. 1854; DEML, I.: Revision der Sektionen *Acanthophaea* Bunge und *Aegacantha* Bunge der Gattung *Astragalus* L. – Boissiera 21: p. 186, figs. 15, 26 (both as *A. lycioides*) and p. 185, 186, fig. 3, 4 13, 14, 27, 28 (all as *A. schistocalyx*). 1972.

Dwarf spiny subshrubs, 15–35 cm tall, densely or rarely loosely branched at the base with mostly flattened and ribbon-like, in vegetative parts white, in the inflorescence mostly white and black mixed hairs 0.1–1 mm long. Stems 1.5–2.5 mm diam. in first year, densely covered with appressed to ascending hairs 0.1–0.5 mm long, glabrescent with age to glabrous in the next year. Stipules chartaceous, yellowish, mostly deflexed from the middle, 1–4 mm long, adnate to the petiole for ca. 1/2–2/3 of their length, triangular or \pm oblong-acuminate, densely covered with appressed to ascending hairs. Leaves 1.3–6.5 cm long; rhachides \pm dense, thin, rigid, densely appressed hairy, gradually glabrescent; terminal spine 2–5 times as long as the uppermost leaflets; petiole ca. 1/3 as long as the rhachis. Leaflets in 4–9 pairs, mostly complicate, rarely flat, greyish green to green, 1–4 \times 1–2.5 mm, obovate, retuse at the apex, on upperside glabrous or sparsely hairy, on underside more densely hairy. Peduncles 0.3–2.2 cm long, with appressed to ascending hairs. Racemes loosely 2–6(–9)-flowered. Bracts narrowly

triangular, 1–2 mm long, sparsely hairy or only ciliate at the margins. Pedicels ca. 2 mm long, hairy like the peduncle. Bractcoles mostly present at the base of calyx, single or rarely in pairs, 0.5–1.5 mm long, subulate, hairy. Calyx yellowish, often flushed with red, 8–13 mm long and 2–3 mm in diam., sparsely to rather densely covered with appressed to spreading white and greyish-black, rarely only with white hairs up to 1.2 mm long; teeth 1.5–3 mm long, mostly unequal, subulate. Petals pink to violet. Standard hairy on midrib at the dorsal surface, 16–25 mm long and 5–9 mm wide, without sharply differentiated claw, obovate to ± elliptic-pandurate, mostly shallowly constricted at middle, retuse at the apex. Wings (12–)14–21 mm long; blades narrowly oblong, obtuse at the apex, 7–9 × 2 mm; auricle 0.5–0.8 mm long. Keel (11–)14–19 mm long; blades 5.5–8 × 2–2.5 mm. Legumes with a stipe ca. 1 mm long, narrowly elliptic, 10–11(–13) mm long, 2–3 wide and 3–6 mm high, laterally compressed, bilocular; valves coriaceous, densely covered with appressed to spreading hairs. Seeds 4–12. Distribution: NE, C and S Iran.

Specimens seen:

Iran. Prov. Esfahan: Karkas mts. S Natanz, 2500 m, 28.6.1973, *Andersen & Jensen* 7295 (E, L) – inter Isfahan et Teheran, Kohrud, V.1859, *Bunge & Bienert* (K, P) – S Kashan, Kuh-e Karkas, 27.5.1974, *Iranshahr s.n.* (IRAN) – Natanz, 1500 m, 19.5.1975, *Iranshahr* 40962 (IRAN, W) – Natanz, above the village Abianeh, 2600 m, 29.7.1993, *Maassoumi & al.* 71919 (MSB) – before Meymeh, on the road of Soh (Sof), before Delhor village, 2100 m, 4.9.1993, *Maassoumi & Zarre* 72013 (MSB) – Kashan, Kamow, Kuh-e Gar-gash, 2400–3200 m, 5.7.1984, *Moussavi & Tehrani* 41584 (W) – Kuh-e Karkas, in saxosis prope stationem Radar, 2880 m, *Rechinger* 1974 (M, W) – Kashan, Natanz, 1500 m, *Rechinger* 52056 (M, W) – Taleghan, c. 30 km SW Ardestan, 2000 m, 15.5.1974, *Wendelbo & Foroughi* 11530 (W) – Kuh-e Karkas, near television mast N side of pass, N Tarq, 2700 m, 14.5.1974, *Wendelbo & Foroughi* 11428 (W) – Kuh-e Karkas area, just N Tarq, 15.5.1974, *Wendelbo & Foroughi* 11456 (W) – prope Isfahan, *Aucher-Eloy* 1270 (G, G-BOIS, K, P) – in m. Korud pr. Isfahan, *Bode* (G-BOIS, LE) – prope Ssof N Isfahan, 22.5.1847, *Buhse* 1450 (G, G-BOIS). – Prov. Kerman: Kuh-e Jebal Barez, Kuh-e Sarzeh, 5 km NE Garraghan, E of road from Jiroft to Deh Bakri, 3000–3500 m, 13.6.1977, *Assadi & al.* 2131 (E) – in reg. alpina montis Kuh-i Dschupar, 3000–3400 m, 10.6.1892, *Bornmüller* 3718 (B, WU) – in monte Kuh-i-Nasr, 3800 m, 4.7.1892, *Bornmüller* 3719 (B, G) – in monte Kuh-i Sirdsch, 2700 m, 22.5.1892, *Bornmüller* 3720 (B, WU) – in monte Kuh-i Lalesar, 3800–3900 m, 17.7.1892, *Bornmüller* 3721 (B) – dto., 2650–3000 m, 24.6.1976, *Moussavi & Tehrani* 36794 (IRAN, W) montes Kuh-e Jebal Barez in vicinitate vici Deh Bakri, 1700–2700 m, 2.5.1973, *Soják* 3967 (PR) – Syrtsch inter Chäbbis et Kerman, iv.1859, *Bunge & Bienert* (G-BOIS, GOET, K, L, LE, M, P, W). – Prov. Khorasan: Neyshabur, Sheykh Abol-Hassan, Binaloud, 1500–2250 m, 30.–31.7.1976, *Termeh & Tehrani* 35139 & 35144 (IRAN, W) – in monte Kuh-e Bizg, 4.–6.7.1937, *Rechinger* 1442 (K, W) – in Monte Kuh-e Bizg, 2000 m, *Gaubá & Mirdamadi* 527 (W) – Kuh-e Bizg near Turbat-e Shaik Djam, 17.6.1885, *J.E.T. Aitchison* 666 (C, K, P, W) – environs de Mughan et versant nord de la Kuh-i Binalud, 1900–2300 m, *Schmid* 6259 (E, W), 6260 (W) – montes Kuh-e Binalud, ca. 20 km bor.-orient. ab oppido Neyshabur, 2300–2800 m, 14.6.1977, *Soják* 7662 (PR) – inter Nischapur et Mesched, fl., 12.6.1858, *Bunge & Bienert* (G-BOIS, GOET, K, P, W). – Prov. Yazd: Shirkuh, 20 km SSW Taft, 2700 m, 25.5.1977, *Aryavand & al.* 1427 (E) – Schir Kuh, 3960 m, 24.7.1932, *Balls* 138 (K) – Deh-Bala, Shirkuh mt., 3500 m, 21.6.1975, *Foroughi & Assadi* 17963 (G) – Taft, Gharih-ye Hedesh, Deh-bala, Shir-kuh, 2800–3300 m, 10.6.1976, *Moussavi & Tehrani* 36789 (IRAN, W) – dto., 2300–2600 m, 12.6.1976, *Moussavi & Tehrani s.n.* (IRAN) – dto. 16.7.1976, *Moussavi & Tehrani* 35025 (IRAN, W)

Note: The holotypes of both *A. pseudoangustifolius* and *A. schistocalyx* subsp. *bizgi-montanus* are very young plants without mature fruits. Since the pod structure is very important in *A. sect. Acanthoplace*, it was necessary to select epitypes as reference material

for these species. The specimen *Rechinger 1442* in *W* fits in all respects the description of both names and was collected like the others two from the famous NE Iranian mountain “Kuh-e Bizg”. Therefore *Rechinger 1442* is selected here as an epitype for both the others.

DEML (1972) gave three differences for separating *A. schistocalyx* from *A. lycioides*: appressed hairs on calyx of *A. schistocalyx* (against spreading ones in the latter), peduncles 1–3 (–7) mm long (against 5–22 mm long in *A. lycioides*), and racemes with 2–5 flowers (not up to 8 as in *A. lycioides*). However the examined specimens show a high variability in all these characters, which does not support the separation of two species. For example the specimens collected from the area about Natanz and Ardestan (Prov. Esfahan), i.e. *Andersen & Jensen 7295* (E, L), *Rechinger 52056* (M, W) and *Wendelbo & Foroughi 11530* (W), and also a specimen from Prov. Khorassan, namely *Soják 7662* (PR), possess long peduncles up to 12 mm and inflorescences with 8–12 flowers, but appressed calyx hairs. Moreover, some specimens collected from an area near the type locality of *A. lycioides* (Soh), i.e. *Maassoumi & Zarre 72013* (M) and *Wendelbo & Foroughi 11456* (W), show the subappressed type of calyx hairs and are in all other respects intermediate between *A. lycioides* and *A. schistocalyx*. Therefore, the name *A. schistocalyx* is reduced here to synonymy under *A. lycioides*.

Astragalus ovigerus Boiss., Diagn. Pl. orient., ser. 1, 2: 67. 1843 ≡ *Phaca ovigera* (Boiss.) Boiss., Diagn. Pl. orient., ser. 1, 6: 35. 1846. Holotype: Persiae alpihus Zerdkou, *Aucher 1277* (G-BOIS!; iso: BM!, G!, K!, P!).
= *A. lamprocarpus* Maassoumi (1994) 1995: Iran. J. Bot. 6: 199 (1994) 1995. Holotype: [Iran] Lorestan, Ghali Kuh (E of the pass on road Aligodarz-Shoulabad), 3100–3600 m, 1.7.1977, *Runemark & Lazari 26506* (TARI!).

Figures: DEML, I.: Revision der Sektionen *Acanthophaea* Bunge und *Aegacantha* Bunge der Gattung *Astragalus* L. – Boissiera 21: p.185, 186, fig. 5, 22–23. 1972.

Dwarf spiny subshrubs, 15–30 cm tall, densely branched at base, with mostly flattened, rarely cylindric-acute, in vegetative parts white, in the inflorescences white and black or sometimes merely black hairs 0.1–1.5 mm long. Stems of the current year 1–3.5 mm diam., up to 1 cm long, appressed hairy, soon glabrescent. Stipules chartaceous, yellowish-white, 5–8 mm long, adnate to the petiole for 1/2–2/3 of their length, widely ovate-acuminate, densely appressed hairy. Leaves 2–9 cm long; rhachides ± dense, thick, rigid, densely appressed hairy, gradually glabrescent, in the second year glabrous; terminal spine 1/1–3/1 as long as the uppermost leaflets; petiole 1/3–1/2 as long as the rhachis. Leaflets in 7–10(–15) pairs, ± flat, greyish green, 1.5–9 × 1–3 mm, narrowly ovate to narrowly obovate or obovate to elliptic, at the apex obtuse with a minute mucro 0.2–0.8 mm long, on both sides loosely to densely covered with appressed to ascending hairs. Peduncles 1–3 cm long, densely hairy. Racemes loosely 1–3-flowered. Bracts chartaceous, 3–4 mm long and ca. 1.5 mm wide, narrowly triangular, hairy. Pedicels 2–4 mm long, predominantly black hairy. Bracteoles rarely present, ca. 2 mm long, subulate. Calyx greyish green, flushed with red, tubular, 11–14 mm long and 3–5 mm in diam., densely covered with spreading, predominantly black hairs; teeth 1.5–2.5 mm long, triangular. Petals reddish to violet. Standard 22–27 mm long and 8–12 mm wide,

without distinctly differentiated claw, \pm obovate-elliptic, scarcely constricted at middle, shallowly retuse at the apex. Wings 18–24 mm long; blade, narrowly oblong, obtuse at the apex, $9\text{--}13 \times 2.5\text{--}4$ mm; auricle 0.6–1 mm long. Keel 15–19 mm long; blades oblong-curved, obtuse at the apex, $7\text{--}8 \times 4$ mm. Staminal tube obliquely cut at the mouth, filaments with 6–7 mm long free ends. Ovary shortly stipitate, sparsely hairy; style hairy in lower third. Legumes ovoid, 30–37 mm long, carinate ventrally, shallowly grooved dorsally, shortly acuminate at the apex, sparsely hairy to glabrescent, unilocular.

Specimens seen:

Iran. Prov. Chahar Mahal Bakhtiari: Persiae alpinus Zerdkou, *Aucher 1277* (BM, G, G-BOIS, K, P). – Prov. Lorestan: Kuh-i-Shuturan, 2440 m, 26.5.1941, *Koelz 17824* (US) – Ghali Kuh (E of the pass on road Aligodarz-Shoulabad), 3100–3600 m, 1.7.1977, *Runemark & Lazari 26506* (TARI!).

Note: The holotype of *A. lamprocarpus* was only for a short time available for investigation and therefore no detailed analysis could be made. Nevertheless no differences could be found between it and *A. ovigerus*. Moreover, the specimen *Koelz 17824* (US) was collected from the same area as the holotype of *A. lamprocarpus* and agrees with *A. ovigerus*. In the original description (MAASSOUMI 1994), *A. lamprocarpus* is not compared with *A. ovigerus*, but it fits in all respects the description of the latter.

A. ovigerus and *A. hezarensis* are the only species of *A. sect. Acanthophaea* which possess unilocular pods. Moreover, their fruits represent the larger ones within the section. However, these features are not enough to separate them as a section distinct from *A. sect. Acanthophaea* as MAASSOUMI (1995) did with *A. sect. Lamprocarpa*. For a more detailed discussion see ZARRE (2000: page 22).

A. ovigerus is a paleoendemic species which shows a disjunct distribution pattern. Moreover, the species is very rare in the distribution area and does not form dense populations.

Astragalus sclerocladus Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 46. 1868 [et l.c. 15(1): 75. 1869] \equiv *Tragacantha scleroclada* (Boiss.) Kuntze, Revis. Gen. 2: 947. 1891 \equiv *A. schistocalyx* Bunge subsp. *sclerocladus* (Bunge) I.Deml, Boissiera 21: 34. 1972. Syntypes: env. de Kohrud, *C.P. Bélanger 693* (P!); inter Sof et Kohrud, v.1859, *A. von Bunge & T. Bienert*. Lectotype (PODLECH 1998): [Iran] inter Sof et Kohrud [inter Isfahan et Teheran], v.1859, *A. von Bunge & T. Bienert* (P!): photo MSB!; iso: G-BOIS!, GOET!, K!; photo MSB!, L!, LE!, W!).

Spiny shrubs, 20–60 cm tall, densely or rarely loosely branched at the base with mostly flattened and ribbon-like, only white hairs 0.1–0.8 mm long. Stems 1.5–3 mm diam. in the first year, densely appressed hairy, glabrescent with age. Stipules chartaceous, yellowish, mostly reflexed from the middle, 1–2 mm long, adnate to the petiole for ca. 1/2 of their length, widely triangular-acuminate, densely appressed hairy. Leaves 0.5–4 cm long; rachides \pm remote, thick, rigid, densely hairy, sericeous, gradually glabrescent and glabrous in the second year; terminal spine 1–3 times as long as the uppermost leaflets; petiole ca. 1/4–1/3 as long as the rachis. Leaflets 3–6 pairs, mostly flat, greyish green to light green, $3\text{--}8 \times 2\text{--}5$ mm, obovate

to orbicular or subcordate, rarely narrowly obovate, retuse at the apex, sparsely appressed hairy, especially at the midrib and the margins, soon glabrescent. Peduncles 0.1–0.5 cm long, densely appressed hairy. Racemes loosely 2–6-flowered. Bracts narrowly triangular ovate, 1–2 mm long and 0.7–1 mm wide, chartaceous, densely appressed hairy. Pedicels 1–2 mm long, hairy. Bracteoles rarely present, in pairs at the pedicel, ca. 0.8 mm long, subulate, hairy. Calyx yellowish, mostly flushed with red in upper part, 6–9 mm long and 2–4 mm in diam., sparsely to rather densely appressed white hairy; teeth 1–3 mm long, mostly unequal, subulate. Petals pink to red. Standard 12–18 mm long and 5–6.5 mm wide, without sharply differentiated claw, ± elliptic-pandurate, mostly shallowly constricted at middle, retuse at tip. Wings slightly shorter than standard; blade narrowly oblong, obtuse at the apex, 6–8.5 × 2 mm; auricle 0.4–0.6 mm long. Keel 10–14 mm long; blades 5–6.5 × 2–2.5 mm. Legumes shortly stipitate, elliptic, 6–8(–10) mm long and ca. 4 mm high, laterally compressed, bilocular; valves coriaceous, densely appressed hairy. Seeds 3–9.

Specimens seen:

Iran. Prov. Esfahan: Kuh Barsuk, Kohrud-Gebirge, 27.6.1906, *Strauss* (B) – In m. Kuh-i Kohrud, 10.5.1908, *Bornmüller* (B) – env. de Kohrud, *C.P. Bélanger* 693 (P) – inter Sof et Kohrud [inter Isfahan et Teheran], V.1859, *Bunge & Bienert* (G-BOIS, GOET, K, L, LE, P, W) – Kashan, Niassar, 23.5.1970, *Iranshahr 14662* (IRAN) – ca. 2 km from deviation of Ghamsar, on the road to Ghohrud, 1800 m, 4.9.1993, *Maassoumi & Zarre 72018* (MSB, TARI) – In m. Kashan, on the road to Ghohrud, 12 km to Ghohrud, 2150 m, 11.3.1990, *Zarre 69116* (MSB, TARI).

Note: *A. sclerocladus* is a narrowly endemic species known only from the submontane regions around Ghohrud village south of Kashan (centre of Iran). In this region *A. sclerocladus* forms relatively dense populations and is one of the dominant species. This species has been reduced to subspecies rank by DEML (1972), in spite of considerable differences between the two taxa. In its vegetative form, *A. sclerocladus* is the largest species of *A.* sect. *Acanthophaea*. Moreover, it is the only species of the section whose paraclades are borne on the short lateral branches and not directly on the main stem: a character which relates this species to *A.* sect. *Poterion* Bunge (another basal section within the thorny *Astragali*). Beside these features, the obovate and deeply retuse leaflets of *A. sclerocladus* separate it from *A. lycioides*. Because of the above, MAASSOUMI's (1994) opinion in considering *A. sclerocladus* as a distinct species from *A. lycioides* is well supported.

Astragalus stenostegius Boiss. & Hausskn., Fl. Or. 2: 314. 1872 ≡ *Tragacantha stenostegia* (Boiss.) Kuntze, Revis. Gen. 2: 948. 1891. Lectotype (designated here; DEML 1972 as holotype): [Iran/Iraq] Mt. Avroman et Schahu Kurdistaniae, 1000–12000', VII.1867, *H.C. Haussknecht* (G-Boiss!; photo MSB!; iso: G-BOIS!; photo MSB!, JE!, K!, P!).
= *A. spinellus* Boiss. & Hausskn., Fl. Or. 2: 315. 1872 ≡ *Tragacantha spinella* (Boiss.) Kuntze, Revis. Gen. 2: 948. 1891. Holotype: [Iran/Iraq] Mt. Avroman et Schahu Carduchiae Persiae, VII.1867, *H.C. Haussknecht* (G-Boiss!; photo K, MSB!).

Figures: DEML, I., Revision der Sektionen *Acanthophaea* Bunge und *Aegacantha* Bunge der Gattung *Astragalus* L. – Boissiera 21: p. 185, 186, Fig. 6–8, 19 & 24. 1972.

Dwarf spiny subshrubs, 15–35 cm tall, densely or loosely branched at the base with mostly flattened, ribbon-like, in vegetative parts white, in the inflorescens mixed with black hairs 0.1–1 mm long. Stems 1.5–2.5 mm diam. in first year, glabrous. Stipules membranous, yellowish-white, 3–6 mm long, adnate to the petiole for ca. 1/2 of their length, narrowly triangular, ciliate at margins and apex, glabrous otherwise. Leaves 1.7–4 cm long; rachides \pm dense, thin or rarely thick, rigid, densely covered with appressed to spreading hairs up to 0.8 mm long, glabrescent with age and glabrous in the next year; terminal spine 1–3 times as long as the uppermost leaflets; petiole ca. 1/3 as long as the rachis. Leaflets in 4–7 pairs, slightly complicate to flat, green, 3–8(–10) \times 1–2.5 mm, narrowly ovate to narrowly obovate, at the apex rounded to shallowly retuse, on both sides sparsely \pm appressed hairy. Peduncles 0.2–1 cm long, with appressed to spreading hairs. Racemes loosely 3–6-flowered. Bracts narrowly triangular to subulate, 1.5–2.5 mm long and 0.5–1 mm wide, membranous, sparsely white hairy. Pedicels 1–1.5 mm long, hairy. Bracteoles absent. Calyx yellowish, sometimes flushed with red, 5–9 mm long and 1.5–3 mm diam., tubular-campanulate, densely covered with spreading hairs up to 1 mm long; teeth 1.5–3 mm long, mostly unequal, subulate or linear. Petals pink to violet. Standard 10–13 mm long and 4–5 mm wide, without sharply differentiated claw, \pm elliptic-pandurate to obovate, mostly shallowly constricted at middle, retuse at the apex. Wings 8–11 mm long; blades narrowly oblong, obtuse at the apex, 4.5–6 \times ca. 1.5 mm; auricle 0.3–0.6 mm long. Keel 7–9 mm long; blades ca. 4.5 \times 2 mm. Legumes (immature), ca. 8–10 mm long, laterally compressed, bilocular.

Specimens seen:

Iran. Prov. Hamadan: In monte Elwend, VI.1902, *Strauss* (B). – Prov. Kordestan: Mt. Avroman et Schahu Kurdistaniae, 3050–3650 m, VII.1867, *Hausknecht* (G-BOIS, JE, K, P). – Prov. Lorestan: In m. Kuh-i Gerru, VII.1902, *Strauss* (B, JE) – dto., 2.8.1908, *Strauss* (B, JE, P, WU). – Prov. Markazi: in m. Raswend, VIII.1899, *Strauss* (B).

Note: The collection of *Strauss* from Monte Elwend (B) differs from other specimens in having more robust and longer spines, larger calyx (9–13 mm long) and standard 20–24 mm long. Moreover, the calyx is exclusively black hairy in this specimen, in contrast to other examined sheets with high proportion of white hairs too. The shape and size of bracts, however, match the type of *A. stenostegius*. More material and studies are needed for the final systematic positioning of this specimen. Most probably it is a representative of a new taxon.

DEML (1972) expressed her doubt on the identity of *A. spinellus* and *A. stenostegius*. The type material of both species, which was collected from the borders between Iran and Iraq and probably from the same locality, shows only one difference regarding the size of leaves which are very small in *A. spinellus*. The material collected by *Strauss* from Kuh-i Gerru (near Nehawend, W Iran) in both herbaria B and JE is intermediate in this respect and therefore *A. spinellus* is reduced here to synonymy.

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